

Claims

17. A composition of matter comprising a Y-Ba-Cu-O complex of nominal formula:  $(Y_{1-x}Ba_x)_aCu_bO_y$ , wherein "x" is about 0.01 to 0.5, "a" is about 1 to 2, "b" is 1, and "y" is about 2 to about 4, containing a superconductive crystalline phase consisting essentially of Y, Ba, Cu and O which has zero electrical resistance at 77°K or above, said superconductive crystalline phase having a crystal structure uncharacteristic of that of a  $K_2NiF_4$  crystal structure, and said superconductive crystalline phase being present in said composition of matter in a quantity sufficient to provide the composition with a diamagnetic signal at 4.2°K corresponding to at least 24% of the superconducting signal of a lead sample with similar dimensions.
18. A composition of matter comprising a Y-Ba-Cu-O complex of nominal formula  $(Y_{1-x}Ba_x)_aCu_bO_y$ , wherein "x" is 0.4, "a" is 2, "b" is 1, and "y" is about 2 to about 4, containing a superconductive crystalline phase consisting essentially of Y, Ba, Cu and O which has zero electrical resistance at 77°K or above, said superconductive crystalline phase having a crystal structure uncharacteristic of that of a  $K_2NiF_4$  crystal structure, and said superconductive crystalline phase being present in said composition of matter in a quantity sufficient to provide the composition with a diamagnetic signal at 4.2°K corresponding to about 24% of the superconducting signal of a lead sample with similar dimensions
19. A composition of matter comprising a Y-Ba-Cu-O complex containing a superconductive crystalline phase consisting essentially of Y, Ba, Cu and O which has zero electrical resistance at 77°K or above, said superconductive crystalline phase having a crystal structure uncharacteristic of that of a  $K_2NiF_4$  crystal structure, and said superconductive crystalline phase being present in said composition of matter in a quantity sufficient to provide the composition with a diamagnetic signal at 4.2°K corresponding to at least 24% of the superconducting signal of a lead sample with similar dimensions.

20. A method for conducting an electrical current without electrical resistive losses, comprising the steps of:

utilizing as a conductor a composition of matter comprising a Y-Ba-Cu-O complex of nominal formula  $(Y_{1-x}Ba_x)_aCu_bO_y$ , wherein "x" is about 0.01 to 0.5, "a" is about 1 to 2, "b" is 1, and "y" is about 2 to about 4, containing a superconductive crystalline phase consisting essentially of Y, Ba, Cu and O which has zero electrical resistance at 77°K or above, said superconductive crystalline phase having a crystal structure uncharacteristic of that of a  $K_2NiF_4$  crystal structure, and said superconductive crystalline phase being present in said composition of matter in a quantity sufficient to provide the composition with a diamagnetic signal at 4.2°K corresponding to at least 24% of the superconducting signal of a lead sample with similar dimensions;

cooling said composition of matter to a temperature at or below that at which said crystalline phase becomes superconductive; and

initiating a flow of electrical current within said composition of matter while maintaining said composition of matter at or below the temperature at which said crystalline phase becomes superconductive.

21. A method for conducting an electrical current without electrical resistive losses, comprising the steps of:

utilizing as a conductor a composition of matter comprising a Y-Ba-Cu-O complex of nominal formula  $(Y_{1-x}Ba_x)_aCu_bO_y$ , wherein "x" is 0.4, "a" is 2, "b" is 1, and "y" is about 2 to about 4, containing a superconductive crystalline phase consisting essentially of Y, Ba, Cu and O which has zero electrical resistance at 77°K or above, said superconductive crystalline phase having a crystal structure uncharacteristic of that of a  $K_2NiF_4$  crystal structure, and said superconductive crystalline phase being present in said composition of matter in a quantity sufficient to provide the composition with a diamagnetic signal at 4.2°K corresponding to about 24% of the superconducting signal of a lead sample with similar dimensions;

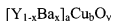
cooling said composition of matter to a temperature at or below that at which said crystalline phase becomes superconductive; and

initiating a flow of electrical current within said composition of matter while maintaining said composition of matter at or below the temperature at which said crystalline phase becomes superconductive.

22. A superconducting composition exhibiting zero electrical resistance at a temperature of 40°K or above consisting essentially of yttrium, barium, copper and oxygen.

23. The superconducting composition of claim 22 wherein the composition exhibits zero electrical resistance at a temperature of 77°K or above.

24. The superconducting composition of claim 23 having the nominal formula



wherein x is 0.4, a is 2, b is 1, and y is 2 to 4.

25. The superconducting composition of claim 22 wherein said composition has a crystal structure uncharacteristic of that of a  $K_2NiF_4$  crystal structure.

26. The superconducting composition of claim 23 wherein said composition has a crystal structure uncharacteristic of that of a  $K_2NiF_4$  crystal structure.

27. A superconducting composition exhibiting zero electrical resistance at a temperature of 77°K or above having the nominal formula



wherein "a" is about 1.2, "b" is about 0.8, "c" is about 1.0, and "x" is about 2 to 4.